

What is claimed is:

1. An apparatus for breathing an air mixture expired by a user, providing an air mixture which has lower oxygen concentration than the ambient air, said apparatus comprising:

an expiratory path, said expiratory path communicating with a reservoir, said reservoir being of adjustably variable volume ;

an inspiratory path communicating with said reservoir through a CO₂ absorption chamber; and

a directional valve, said directional valve allowing single direction flow of air through both said expiratory path and said inspiratory path; and

means of communication of said expiratory path and said inspiratory path in sealed engagement with the respiratory system of a user.

2. The apparatus of claim 1 wherein said reservoir additionally comprises:

means to vary the volume of the said reservoir from a minimum volume area to a maximum volume area.

3. The apparatus of claim 2 wherein said means to vary the volume of said reservoir comprises:

said reservoir formed by a flexible membrane;

said flexible membrane housed in a chamber, said chamber formed inside a reservoir case having a sidewall, an endwall and an aperture end opposite said endwall; and

means to vary the volume of said chamber thereby limiting the expansion of said flexible membrane forming said reservoir.

4. The apparatus of claim 3 wherein said means to vary the volume of said chamber comprises:

said reservoir case formed of a telescopic sidewall terminating at said endwall on one end and said aperture end, said sidewall extendable from a first position wherein said chamber is of minimum volume to an extended position wherein said chamber is of maximum volume.

5. The apparatus of claim 4 wherein said means to vary the volume of said chamber additionally comprises:

said sidewall extendable to at least one additional different position between said first

position and said extended position; and

means to hold said sidewall in said at least one additional different position thereby allowing user adjustment of the total volume of said chamber and concurrently total volume of said reservoir.

6. The apparatus of claim 1 additionally comprising

means for mixing inspired air communicated to said user from said inspiratory path with ambient air, thereby adjusting oxygen content of said inspired air.

7. The apparatus of claim 2 additionally comprising:

means for mixing inspired air communicated to said user from said inspiratory path with ambient air, thereby adjusting oxygen content of said inspired air.

8. The apparatus of claim 3 additionally comprising:

means for mixing inspired air communicated to said user from said inspiratory path with ambient air, thereby adjusting oxygen content of said inspired air.

9. The apparatus of claim 6 additionally comprising:

said means for mixing inspired air communicated to said user being adjustable thereby allowing more or less ambient air to communicate with said inspiratory path to provide means to adjust oxygen levels of said inspired air.

10. The apparatus of claim 7 additionally comprising:

said means for mixing inspired air communicated to said user being adjustable thereby allowing more or less ambient air to communicate with said inspiratory path to provide means to adjust oxygen levels of said inspired air.

11. The apparatus of claim 8 additionally comprising:

said means for mixing inspired air communicated to said user being adjustable thereby allowing more or less ambient air to communicate with said inspiratory path to provide means to adjust oxygen levels of said inspired air.

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12. The apparatus of claim 3 additionally comprising:

apertures communicating through said sidewall with between said chamber and ambient air adjacent to said sidewall;

said reservoir membrane comprised of flexible thermo-conductive material that effectively equalizes the temperature of the expired air in said reservoir with communicating ambient air, thereby providing a means to decrease dew point of the said expired air in order to reduce humidity thereof and a means to decrease temperature of said expired air.

13. The apparatus of claim 4 additionally comprising:

apertures communicating through said sidewall with between said chamber and ambient air adjacent to said sidewall;

said reservoir membrane comprised of flexible thermo-conductive material that effectively equalizes the temperature of the expired air in said reservoir with communicating ambient air, thereby providing a means to decrease dew point of the said expired air in order to reduce humidity thereof and a means to decrease temperature of said expired air.

14. The apparatus of claim 11 additionally comprising:

apertures communicating through said sidewall with between said chamber and ambient air adjacent to said sidewall;

said reservoir membrane comprised of flexible thermo-conductive material that effectively equalizes the temperature of the expired air in said reservoir with communicating ambient air, thereby providing a means to decrease dew point of the said expired air in order to reduce humidity thereof and a means to decrease temperature of said expired air.

15. The apparatus of claim 6 wherein said means for mixing inspired air communicated to said user from said inspiratory path with ambient air comprises one or a combination of: at least one passage communicating between said inspiratory path and ambient air and a demand valve, said demand valve opening when the volume of the said breathing reservoir is fully depleted thereby allowing replenishment of the breathing volume for the user.

16. The apparatus of claim 9 wherein said means for mixing inspired air communicated to said user from said inspiratory path with ambient air comprises one or a combination of: at least

one passage communicating between said inspiratory path and ambient air and a demand valve, said demand valve opening when the volume of the said breathing reservoir is fully depleted thereby allowing replenishment of the breathing volume for the user.

17. The apparatus of claim 1 additionally comprising:

said reservoir positioned below said CO₂ absorption chamber and providing a means for collection of moisture in air expired by said user and holding said moisture in said reservoir with gravity thereby substantially preventing said moisture from communication with said CO₂ absorption chamber.

18. The apparatus of claim 12 additionally comprising:

said reservoir positioned below said CO₂ absorption chamber and providing a means for collection of moisture in air expired by said user and holding said moisture in said reservoir with gravity thereby substantially preventing said moisture from communication with said CO₂ absorption chamber.

19. The apparatus of claim 1 wherein said breathing reservoir is disposable and may be removed and replaced when a training session is finished.

20. The apparatus of claim 3 wherein said breathing reservoir is disposable and may be removed and replaced when a training session is finished.

21. The apparatus of claim 1 wherein said inspiratory path is equipped with a port for communication of an oxygen analyzer with air in said inspiratory path, said oxygen analyzer capable of display of indicia showing the oxygen concentration in the inspired air mixture.

22. The apparatus of claim 3 wherein said CO₂ absorption chamber is a canister;
said canister having a chemical means for a CO₂ absorption located therein; and
means for attachment of said cannister to said case to said aperture end of said reservoir case with said chemical means in communication with said reservoir, whereby said cannister is replaceable.